Government of Saskatchewan

Annual Report 1990-91

Saskatchewan Energy and Mines

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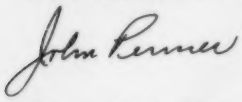
Letter of Transmittal

The Honourable Sylvia Fedoruk
Lieutenant-Governor
Province of Saskatchewan

Dear Madame:

I have the honour to submit herewith the Annual Report of Saskatchewan Energy and Mines for the fiscal year ending March 31, 1991.

Respectfully Submitted,



Honourable John Penner
Minister of Energy and Mines

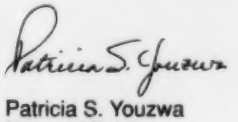
Letter of Transmittal

The Honourable John Penner
Minister of Energy and Mines
Province of Saskatchewan

Dear Sir:

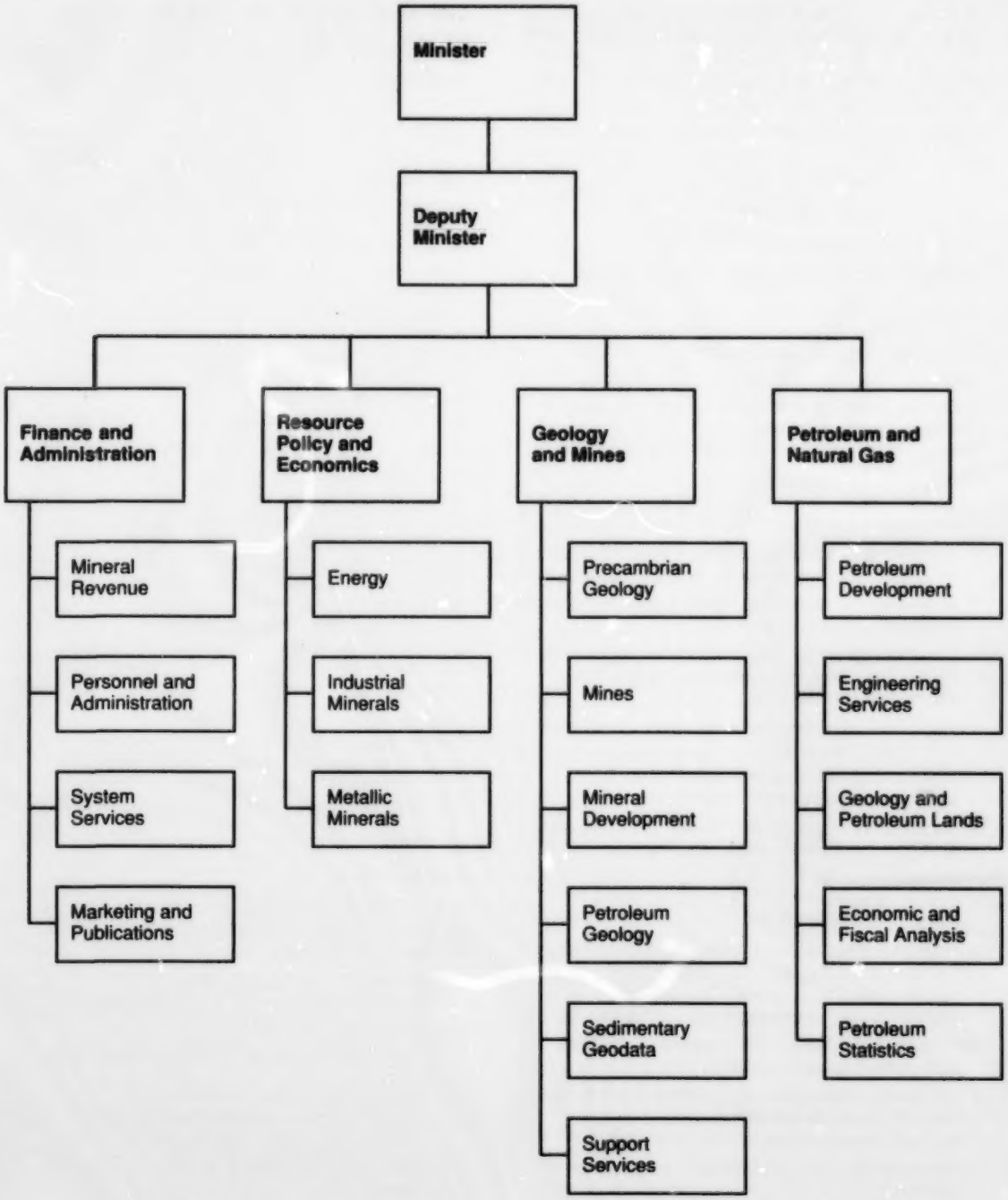
I have the honour to submit for your consideration, the Annual Report of Saskatchewan Energy and Mines for the fiscal year ending March 31, 1991.

Respectfully Submitted,



Patricia S. Youzwa
Deputy Minister
Saskatchewan Energy and Mines

Organization Chart



Finance and Administration Division

Ray Clayton
Assistant Deputy Minister

The Finance and Administration Division is responsible for mineral revenue collection and audits, internal administration and personnel, legislative co-ordination, mineral rights, system services, marketing and publications.

The Finance and Administration Division is composed of four branches:

- Mineral Revenue
- Personnel and Administration
- System Services
- Marketing and Publications

Mineral Revenue Branch

The Mineral Revenue Branch is responsible for collecting, recording and accounting for the various resource revenues owing to the province and for maintaining mineral land ownership records. The branch:

- ensures that revenues and accompanying returns and reports are received when due;
- assesses various types of resource revenues on an annual or periodic basis;
- assesses interest and/or penalties on late payments and overdue returns;
- processes revenues through computer and manual systems, as input to financial and management information reports;
- audits resource companies to ensure compliance with taxation legislation;
- maintains historical records of all resource revenues received by the department;
- prepares and registers all mineral land transfers to the Crown through forfeiture and voluntary transfer;
- interprets and verifies mineral land ownership for various branches of the department and for industry;
- maintains a mineral land record of all Crown and freehold mineral ownership, which includes an up-to-date record of all Crown mineral land dispositions in the surveyed area of the province;
- verifies Crown mineral lands available for Crown mineral land disposition sales;
- maintains an up-to-date computerized landfile with data identifying all completed, producing and expired oil and gas wells in the province;
- prepares special reports for use by department officials;
- informs the resource industry of its responsibilities under existing legislation and changes thereto; and
- maintains close liaison with other branches of the department on revenue and mineral ownership matters.

This branch is divided into two sections; revenue operations and revenue monitoring. Revenue operations is responsible for receiving and recording of revenue; verification and processing of revenue returns; billing of various royalties, rentals and taxes; taxpayer information and assistance relating to resource taxation legislation, requirements and procedures; maintenance of computer systems and their interface with other department and government systems; processing and payment of incentive grants, compensation payments and payments to holders of trust certificates; follow up of delinquent returns; collection of accounts receivable; and maintains records of all Crown and freehold mineral ownership; verifies Crown mineral lands available for Crown mineral land disposition sales; verifies mineral land ownership for every well that is licensed; maintains a taxable freehold land ownership base for purposes of mineral rights tax assessment.

Revenue monitoring is responsible for office and field audits in all resource revenue areas.

The main objectives of the branch are to ensure that resource revenues owing to the province are received when due, that the amounts paid are correct and properly accounted for, that data is available on a regular and accurate basis for preparation of financial reports, and that a mineral land record of all Crown and freehold land is maintained. To attain these objectives, the branch is committed to a continuous program of review and improvement to existing systems and procedures, or to the development of new systems.

Other objectives include continued and improved communication with taxpayers and the resource industry, greater involvement in policy decisions affecting resource revenues, and training and upgrading of staff to improve the branch's efficiency.

Legislation

The Mineral Revenue Branch administers the revenue provisions of various acts and regulations. Among the more significant are:

The Mineral Resources Act, 1985
- The Delayed Payment Charge Regulations, 1970

The Crown Minerals Act
- The Petroleum and Natural Gas Regulations, 1969
- The Mineral Disposition Regulations, 1986
- The Coal Disposition Regulations, 1988
- The Subsurface Mineral Regulations, 1960

The Freehold Oil and Gas Production Tax Act and Regulations

The Mineral Taxation Act, 1983
- The Potash Production Tax Regulations
- The Freehold Coal Production Tax Regulations
- The Mineral Rights Tax Regulations
- The Agricultural Corporation Exemption Regulations

The Builders' Lien Act

Revestiture of Mineral Rights

In June, 1990, Crown Minerals Act amendments were introduced to provide for the revestiture of mineral rights to holders of non-registeed mineral interests in approximately 2300 parcels of land currently registered in the name of the Crown. The process for final revestiture involves the search, confirmation of ownership and execution of transfers from the Crown to the beneficial mineral owners.

At the end of the 1990-91 fiscal year, the branch had completed reviews of approximately one fourth of the land to be revested. Actual transfers of property are expected to begin in the fall of 1991 pending passage of regulations outlining the method and forms to be used in the transfer process.

Revenues

An increase of 18.3 per cent in total resource revenues was experienced during this fiscal year. Increases in oil, potash, and uranium were significant, with a small decrease in other minerals. Total revenue during 1990-91 amounted to $416.6 million, an increase of $64.6 million over 1989-90.

Source of Revenue	1990-91	1989-90	Per cent Increase (Per cent Decrease)
Heritage Fund			
Oil and Gas	$332,627,112	$288,837,906	15.2
Potash	49,939,588	31,335,233	59.4
Uranium	19,262,148	15,552,944	23.8
Other Minerals	14,745,747	16,288,062	(9.5)
Total	$416,574,595	$352,014,145	18.3
Consolidated Fund			
Mineral Land Tax	$ 5,662,107	$ 5,638,778	0.4
Interest and Penalty	10,986	3,706	196.4
Sales, Services, etc.	284,903	325,839	(12.6)
Receipts from other Governments	191,426	NIL	—
Total	$ 6,149,422	$ 5,968,323	3.0

Incentives and Compensation

The Incentive Grant Program was finalized during 1990-91, with payments during the year totalling $960,806, compared to $115,000 in 1989-90. Legislation was introduced during the year to limit the payment of Compensation to any one recipient to $50,000 per annum, resulting in total payments of $662,700 in 1990-91 as compared to $2.8 million in 1989-90.

Certain mineral rights surrendered to the Crown are encumbered by gross royalty trust certificates. As these lands are leased and brought into production, the branch pays the applicable gross overriding royalty. Payments in 1990-91 totalled $109,981 compared to $104,176 in 1989-90.

Personnel and Administration Branch

The responsibility of the Personnel and Administration Branch is to provide effective human resource and administrative support services to all employees of Saskatchewan Energy and Mines.

The human resource functions include:

- Managing and facilitating staffing actions in a manner that ensures quality and timeliness.
- Providing employee benefits administration and general personnel services that are both responsive and timely.
- Managing classification activity ensuring appropriateness, consistency and timeliness.
- Providing advice on department organization structures.
- Encouraging improved employee performance through the identification, facilitation and assessment of staff development.
- Fostering a positive employee relations environment by encouraging and facilitating recognition based on performance, communications with employees and their representatives and fair and consistent treatment.
- Promoting a working environment in the branch that emphasizes teamwork, communication and individual growth and development.

The administrative support services function include:

- Assisting in the development of a departmental budget that meets program requirements within the context of fiscal restraint.
- Providing timely expenditure forecasts to assist in financial decision making and budget management.
- Ensuring that goods and services required in the discharge of department functions are acquired in an orderly and timely fashion, and that the bills are paid promptly.
- Providing adequate working space and equipment for all employees.
- Developing and maintaining appropriate records to meet the requirements of central agencies.

System Services Branch

System Services Branch provides planning, management, consulting and co-ordination support functions for the development of new and the maintenance and operation of existing information systems for the department. This includes the responsibility for the evaluation and acquisition of computer hardware and software, data-entry, data-security, word processing co-ordination and support. The branch also develops and manages the department's computer services budget.

System analysis, development, and maintenance are performed by branch staff or co-ordinated with consultant services. The department currently operates 20 computer systems on a regular production basis.

The automated systems use a variety of equipment and computers. The branch operates a remote job entry terminal that provides the communication link between the department and Westbridge computers. In addition, on-line terminals and micro-computers are used for on-line data processing, program development, and maintenance.

The following major projects were undertaken in the period under review:

- Detailed design, development and implementation of the Mineral Ownership Detail Subsystem, the Production Monitoring System and the Oil Spill System.
- Detailed design and initial development of the Potash Performance Model, Royalty Status and Well-by-Well royalty calculations in units.
- Implementation of portions of the Production and Disposition System.
- Detailed design of the Revenue Accounting System.
- Implementation of Phase I of the conversion from Wang to Microsoft Word word processing.
- Initiation of a technical column in the department newsletter.
- Initial evaluation of a Database Management System.

Marketing and Publications Branch

Marketing and Publications is responsible for the production, promotion, sales and distribution of information on Saskatchewan resources.

Technical and regulatory information is routinely updated and new publications are prepared as data becomes available. This material is promoted through direct mail, advertisements in trade journals and participation at trade shows and conferences. Sales of technical information totalled $214,028 in the past fiscal year.

This branch provides central information services such as the department inquiry line and print information prepared for the general public and for use in schools. The most common general information package is a series of fact sheets on Saskatchewan resources and a sample set of minerals common to the province. A total of 2,854 information packages where distributed in 1990-91.

Marketing and publications staff also maintain a resource library for use of staff and industry; co-ordinate the department book and journal orders; provide a daily newspaper clipping service for internal use and co-ordinate the production of a department newsletter.

Resource Policy and Economics Division

Mike Benson
Assistant Deputy Minister

The Resource Policy and Economics Division conducts research and analysis of policy issues related to energy and mineral resource development. Information and recommendations are provided to government on policy matters such as: rate of development of the province's energy and mineral resources; pricing and taxation of resources; market access and development; research, development and demonstration activities; nonconventional and renewable energy resources; and environmental issues that impact on the energy and mineral sectors. The division also negotiates with the federal government and other provincial governments on issues of mutual concern in the mineral and energy sectors.

Specific objectives of the Resource Policy and Economics Division are to:

- Monitor and analyse energy and mineral resource markets, industry structure, government policies in other jurisdictions, and comparative fiscal systems in order to assess emerging issues and industry performance.
- Review, modify and develop appropriate policies, strategies and fiscal systems for the energy and mineral sectors.
- Produce timely and accurate long-term forecasts of production, sales, price, royalty revenue, employment and investment in the energy and mineral sectors for policy development, macro-economic forecasting and fiscal planning purposes.
- Negotiate major federal/provincial fiscal issues and arrangements.
- Develop and manage royalty and tax systems for the industrial and metallic mineral resources of the province in order to maintain a balance between a fair economic return to the province and incentives to industry.
- Maintain an awareness of technology issues, problems and opportunities and, consequently, develop policies and strategies that will lead to the more cost-effective and efficient recovery and utilization of our mineral and energy resources.
- Examine the impacts and opportunities of environmental concerns on the energy and mineral sectors of the economy.
- Design and deliver appropriate research, development and demonstration funding programs for the fossil fuel sector and tax incentives for the mineral sector.

The Resource Policy and Economics Division is composed of three branches:

- Energy
- Industrial Minerals
- Metallic Minerals

Energy Branch

The main functions of the Energy Branch are to:

- conduct strategic, market and economic analysis for the development of the province's heavy oil, coal and natural gas resources;
- participate in federal/provincial negotiations on issues of joint interest in the energy sector;
- develop policy options to address problems and opportunities in energy resource development and taxation;
- prepare and co-ordinate economic and revenue forecasts for the energy sector;
- monitor and assess the impact of environmental issues on the energy sector; and
- monitor and encourage energy research, development and demonstration initiatives.

The Energy Branch includes a Policy Section and an Energy Management Section.

Policy Section

Oil

The oil related activities of the Policy Section of the Energy Branch in 1990-91 focussed on monitoring of trade policy issues, particularly the implementation of the Free Trade Agreement with the United States.

Pursuant to the Agreement, the U.S. custom users fee was reduced from .136 per cent to .102 per cent and U.S. tariffs on crude oil and petroleum products were reduced:

- from 3.25 cents to 2.10 cents per barrel of heavy crude and heavy fuel oil;
- from 6.3 cents to 4.2 cents per barrel of light crude oil and diluent; and
- from 31.5 cents to 21 cents per barrel of gasoline and jet fuel.

The section also maintained responsibility for review of takeovers of Canadian oil and gas companies by foreign companies to facilitate assessment by Saskatchewan Trade and Investment of the impact on Saskatchewan.

Natural Gas

The Policy Section of the Energy Branch plays an important role in the deregulation of the natural gas sector and the continued monitoring and evaluation of the impact of deregulation policy initiatives.

The Canadian natural gas sector, as a result of the Agreement on Natural Gas Markets and Prices signed in October 1985, has experienced a significant increase in production, investment and addition to reserves. Allowing prices to be determined through

negotiation between buyers and sellers has benefited producers through access to new markets and consumers through lower prices and increased supply security. Throughout 1990-91, the Policy Section of the Energy Branch participated in the Gas Monitoring Committee which represents the signatory governments to the Agreement.

The Policy Section prepared, on behalf of the department, a submission to the National Energy Board Hearing GH-5-89 on the issue of TransCanada Pipelines Ltd. tolling methodology. The hearing resulted in the Board deciding to continue its use of rolled-in toll methodology; a decision welcomed by the department as supportive of the interests of pipeline users and the realization of the export potential of Saskatchewan's natural gas industry.

In 1990, the Policy Section recommended relaxing the policy requiring Saskatchewan direct purchasers who had left the natural gas distribution system to continue purchasing 35 per cent of their daily requirements from SaskEnergy. Effective November 1, 1990 this policy was changed to reduce from 35 per cent to 20 per cent the proportion of supply that a direct purchaser must acquire from SaskEnergy. Effective November 1, 1991 the policy is scheduled for elimination. These changes reflect the transitional nature of this policy which had been put in place at the time deregulation was implemented to assist SaskEnergy in managing its supply portfolio as its former customers began to direct purchase their own gas supplies.

The Policy Section also administers the natural gas permit system which ensures security of natural gas supply for Saskatchewan consumers. As of March 31, 1991 one hundred and ninety-eight removal permits were issued to 38 producers authorizing the flow of 265 billion cubic feet of natural gas. As of March 31, 1991 one hundred fifty-nine gas use permits were issued to 86 direct purchase customers served by 28 producers authorizing the flow of 43 billion cubic feet of natural gas.

Coal

The Policy Section has responsibility for the identification and analysis of key issues in the coal sector and the regular preparation of economic and revenue forecasts.

The section completed in 1990-91 a major review of coal royalties and taxes. This review evaluated the performance of the existing system and its compatibility with forecasted changes in the market environment. Consultations with the coal industry led to further study of alternative options and structures and a decision to maintain the current royalty and tax regime.

Energy Management Section

The Energy Management Section has the responsibility to assess sustainable development opportunities in the energy sector in Saskatchewan. This includes opportunities to encourage more efficient recovery technology, assessment of environmental impacts which may occur from energy production and use, and the promotion of energy conservation/efficiency measures within government and the province.

The Energy Management Section initiated an energy conservation program late in the fiscal year. The focus of this program was a toll-free phone line providing government employees and the general public with access to energy conservation information.

The Energy Management Section has been working actively with Saskatchewan Environment and Public Safety to develop a Clean Air Strategy for Saskatchewan. This process will provide the government with public and stakeholder input regarding the maintenance of Saskatchewan's high air quality.

In anticipation of possible future actions to reduce the emissions of energy related gases, particularly greenhouse gases, the Energy Management Section has investigated the policy options available to government and the impact of these options on the provincial economy. The section has also investigated the conservation and efficiency options applicable in the province, how much these options would reduce carbon dioxide emissions and what the costs and benefits would be.

The Energy Management Section represented Saskatchewan on the Intergovernmental Secretariat which was established by the Action Committee on Western Canadian Low-Sulphur Coal to Ontario. This Committee is investigating means of improving the competitiveness of western Canadian coal in the Ontario market through projects which are co-operatively supported by the private sector, the federal government, and the Governments of Ontario, Saskatchewan, Alberta and British Columbia.

The Energy Management Section continued to fulfill the obligations of Energy and Mines under the recently expired fossil fuels research programs. This work included the management of ongoing contracts and the preparation of technical reports for distribution.

The Energy Management Section represented the department on a number of interprovincial, national and international committees. The purpose of these committees included energy related environmental concerns as well as the extraction, processing and use of fossil fuels. Participation on these committees fulfills in part the section's responsibility to monitor research initiatives in Saskatchewan, throughout Canada and in other countries to maintain an up-to-date perspective on new energy technologies. These technologies are evaluated to determine if there are any opportunities to apply them within Saskatchewan.

The Section also advises the department regarding alternative energy and energy conservation technologies.

Industrial Minerals Branch

The main functions of the Industrial Minerals Branch are to:

- undertake strategic, market and economic analyses for the development of the province's industrial mineral sector, primarily potash;
- develop policy options to address problems and opportunities in the industrial mineral sector;
- design and implement royalty and tax systems for the production of industrial minerals, including responsibility for legislation and regulations;
- design and implement incentive programs to support industry's efforts in market development and research and development; and
- prepare economic and revenue forecasts for the industrial minerals sector.

During 1990-91, members of the Industrial Minerals Branch:

- prepared and updated long term forecasts of world potash markets, which were also shared and discussed with industry;
- developed revenue forecasts of the industrial mineral sector for fiscal budgeting and planning purposes;
- prepared monthly analyses of potash markets and Saskatchewan industry performance for senior management and ministerial use. The analyses were expanded to monitor other fertilizers.
- continued to administer the market development and research and development incentive program;
- completed studies on other industrial minerals to identify uses and development opportunities;
- provided input into a number of environmental and waste management related initiatives;
- resolved a number of issues related to the administration of the various tax and royalty regimes applicable to industrial minerals;
- developed a new financial computer model to assist the branch in forecasting and tax analysis in the potash area;
- reviewed the department's policy with respect to sand and gravel administration.

Metallic Minerals Branch

The main functions of the Metallic Minerals Branch are to:

- conduct strategic, market and economic analyses for the development of the province's metallic mineral sector, primarily uranium and gold;
- develop policy options to address problems and opportunities in metallic mineral development;
- develop provincial positions and negotiate with the federal and other provincial governments on metallic mineral matters;
- design and implement royalty and tax systems for the production of metallic minerals including responsibility for legislation and regulations;
- review sales contracts to ensure fair market value is received for Saskatchewan uranium; and
- prepare economic and revenue forecasts for the metallic minerals sector.

Principal activities of the Metallic Minerals Branch in 1990-1991 included:

- final stages in the preparation of the uranium royalty amendment regulations, which were proclaimed in June 1990;
- the preparation of monthly analyses of uranium markets for the use of senior management and the minister;
- the development and updates of long-term market and revenue forecasts;
- liaison with other provincial departments particularly those involved in the regulation of the uranium mining industry, including the establishment of the Board of Inquiry for proposed uranium developments;
- analysis and advice to the government regarding a broad range of uranium and nuclear related issues of general concern to the Saskatchewan public;
- input to special reports on taxation, aboriginal participation in mining, and other issues related to the Federal/Provincial mines ministers meetings;
- participation in the Mining Advisory Group of the Saskatchewan Round Table on the Environment and Economy.

Geology and Mines Division

Les Beck
Executive Director

The division is custodian of the departmental geoscience data base and is responsible for the review, storage and synthesis of exploration, mining and production data submitted by industry, as well as disposition of all Crown Minerals other than petroleum, natural gas, helium and oil shale.

The mandate of the division is to promote exploration and development opportunities for the petroleum and mineral industries in the province through geological research and publication, technical data-bases, core collections, symposia, open house meetings and by responding to direct inquiries from representatives of industry and the general public.

The division is organized into five branches:

- Precambrian Geology
- Sedimentary Geodata
- Petroleum Geology
- Mineral Development
- Mines

Cartographic drafting and editorial work for the division is carried out by the Support Services Section, which also provides general drafting services for the department.

Geological mapping and mineral deposit studies continued under the second year of the Mineral Industry Diversification Program. Work was directed towards evaluating the potential of selected areas for gold, base-metals, high-tech minerals, diamonds and a variety of industrial minerals. Negotiations with the federal government concerning a renewal of the Mineral Development Agreement continued throughout the year and at year end an agreement covering a joint program over five years for total expenditures of $10 million was expected to be signed early in the next fiscal year.

Support Services Section

The Support Services Section handles the editing, formatting and production of all geoscientific reports and maps published by the division and, in addition, provides cartographic and drafting services to the rest of the department. A desk-top publishing system and laser printer are used to produce all of the final reports, open file reports, data files, brochures, division forms, and text material for slide presentations at a very high level of quality. During the current fiscal year the section produced two final reports, five miscellaneous reports, three open files, three data files, two maps, and other miscellaneous material, and reprinted two reports. This represents over 2000 pages of text, 40 monochrome maps and cross-sections, and 11 coloured maps.

The cartographic section consists of two working units: Survey Drafting and General Drafting.

The Survey Drafting Unit prepares thematic monochrome and colour geological maps and text figures to the plate-ready stage. These include compilation bedrock geology and metallogenic maps at 1:250,000 scale, outcrop geology and contour maps at various scales, stratigraphic cross-sections, and small size maps and figures for inclusion in reports and externally published scientific papers. During the fiscal year, the unit helped in the production of 45 maps and 10 cross-sections. In addition, 25 to 30 per cent of the cartographic staff's time was spent on special projects such as text figures for articles in scientific journals, slides for graphics for conference presentations and displays, and other promotional material for the department.

The General Drafting Unit maintains and updates the mineral disposition maps, petroleum well location maps, petroleum pool boundary maps, pool area structure contour maps, and potash and coal lease maps. They also prepare the maps and figures for the quarterly Petroleum Land Sale packages, produce an annual update of the coloured Petroleum Development Map of Saskatchewan, prepare numerous text figures, slides and graphics for all areas of the department, and handle blueprint orders for internal use and for sale through the Marketing and Publications Branch. In response to the continued diamond exploration activity in the southern part of the province an additional four 1:50,000 scale mineral disposition maps were added to the department's inventory.

1990/91 Publications

Reports

217 Kreis, L.K. (1991): Stratigraphy of the Jurassic System in the Wapella-Moosomin area, Southeastern Saskatchewan; Sask. Energy Mines, Rep. 217, 90p.

253 Scott, B.P. (1991): Metallogenic Map Series: Reindeer Lake South, NTS Area 64D; Sask. Energy Mines, Rep. 253, 18p, (with 1:250 000 scale map).

Reports Reprinted

30 Byers, A.R. (1957): Geology and Mineral Deposits of the Hanson Lake Area, Saskatchewan; Sask. Energy Mines, Rep. 30, 47p, second reprinting.

76 Wilson W., Surjik, D.L. and Sawatzky, H.B. (1963): Hydrocarbon Potential of the South Regina Area, Saskatchewan; Sask. Energy Mines, Rep. 76, 15p.

Miscellaneous Reports

90-4 Macdonald, R., Sibbald, T.I.I., Harper, C.T., Paterson, D.F. and Guliov, P. eds. (1990): Summary of Investigations 1990, Saskatchewan Geological Survey; Sask. Energy Mines, Misc. Rep. 90-4, 246p. (plus 13 maps).

90-7 Bennett, R.W. (1990): Assessment Work Catalogue, La Ronge Area, Saskatchewan; Sask. Energy Mines, Misc. Rep. 90-7, 380p.

90-8 Bennett, R.W. (1990): Assessment Work Catalogue, Athabasca Area, Saskatchewan; Sask. Energy Mines, Misc. Rep. 90-8, 279p.

91-5 Staff (1991): Mineral Resources of Saskatchewan; Sask. Energy Mines, Misc. Rep. 91-5, 76p.

91-6 Bennett, R.W. (1991): Assessment Work Catalogue, Saskatchewan; Sask. Energy Mines, Misc. Rep. 91-6, 96p.

Open Files

90-2 Roberts, R.G. (1990): Structural Controls of the Box and Athona Deposits, Goldfields Area, Saskatchewan; Sask. Energy Mines, Open File Rep. 90-2, 17p.

91-1 Coombe Geoconsultants Ltd. (1991): Base Metals in Saskatchewan; Sask. Energy Mines, Open File Rep. 91-1, 218p.

91-3 Pearse, G.H.K. (1991): Building Stone Potential in the Creighton-Pelican Narrows Region of Saskatchewan; Sask. Energy Mines, Open File Rep. 91-3, 32p.

Data Files

15 Gracie, A.J. and Scutt, A.G. (1990): Index to La Ronge Core Collection; Sask. Energy Mines, Data File 15, 228p.

16 Slimmon, W.L. and Czornobay, B.M. (1990): Saskatchewan Precambrian Bibliography; Sask. Energy Mines, Data File 16, 118p.

17 Slimmon, W.L., Czornobay, B.M. and Macdonald, R. (1991): Index to the Saskatchewan Precambrian Geochronological Database; Sask. Energy Mines, Data File 17, 85p.

Miscellaneous Publications

MacDougall, D.G. and Guliov, P. (1990): Mineral Resource Map of Saskatchewan; 1990 Edition.

Petroleum Development Map of Saskatchewan; 1990 Edition.

Geological Services Brochure (1991): seventh reprinting.

Precambrian Geology Branch

The Precambrian Geology Branch maintains an ongoing inventory of the geology, geochemistry and related geoscience data of the northern Precambrian Shield region and other subsurface Precambrian rocks in the province. The information, which is produced in reports, maps, data files and through presentations and consultations, is used primarily to promote and assist mineral exploration industry in the province. This information also supports other development and diversification programs including, in more recent years, environmental studies.

Archival geoscience information is stored in a number of computer-based databases. Incremental data were acquired in 1990-91 through field and other projects funded under the Mineral Industry Diversification Program (MIDP) which is retroactively eligible as the provincial contribution to the Canada-Saskatchewan Partnership Agreement on Mineral Development 1990-95. This program is implemented by the Precambrian Geology and Mineral Development Branches. Precambrian expenditures in 1990-91 under this program were at about the same level as 1989-90, approximately $600,000.

Northern Bedrock Reconnaissance

The bedrock geology of about 12,000 square kilometres in northern Saskatchewan is still unmapped. In order to complete reconnaissance coverage the Northern Bedrock Geology Program was initiated in 1989-90. The program was discontinued in 1990-91 due to the high cost, and was replaced by a number of smaller projects in the better-known southeastern part of the Precambrian Shield region.

Precambrian Bedrock Geoscience and Metallogenic Studies

The main component of the Precambrian program continued to be detailed-scale bedrock remapping and supporting studies in areas of high base metal and gold potential. New mapping projects were confined to the region along the Precambrian Shield Margin between the Manitoba border and Deschambault Lake. This region has high mineral potential, and the data gained are expected also to give leads to exploration in the area immediately south of the Shield where several significant base metals occurrences have recently been discovered underlying a cover of Paleozoic sedimentary rocks. The following projects were undertaken:

- A new program was initiated the previous year to remap in detail the volcanic and associated formations of the region between Flin Flon and Amisk Lake as far south as the Shield margin, otherwise known as the East Amisk area. In joint implementation with the Mineral Development Branch this program was expanded in 1990-91 to two field parties mapping at 1:12,500 scale (Fig. 1, A). The Precambrian party mapped to the southwest, covering the Mystic Lake area where there are a number of mineral claims. Three geological terrains have now been recognized in the area, each with distinct mineralizing environments. This mapping was supported by lithogeochemical studies (University of Regina, Fig. 1, B).
- Bedrock remapping at 1:20,000 scale was undertaken in the Snake Rapids area along the Precambrian Shield margin west of Amisk Lake (Fig. 1, C).
- A contract geologist started remapping and re-evaluating the Tabbernor Fault Zone immediately west of Pelican Narrows, with particular reference to geological controls of gold mineralization (Fig. 1, D). A contract was also initiated to investigate the isotope geology of this zone (University of Regina, Fig. 1, D).

- A contractor remapped and reinterpreted the geologically critical area around Tulabi Lake (University of Regina, Fig. 1, E).
- Two contract geologists stayed in during the summer to work on long range reports on the Gee-Sadler Lakes, Laonil-Uskik Lakes, and Brownell-Wapawekka Lakes areas (Fig. 1, F, G and H).
- Supporting geoscience studies in the southeastern part of the Precambrian Shield included P-T studies (University of Calgary, Fig. 1, C and D), and Geochronology (Geochronological Laboratory of the Royal Ontario Museum, Toronto).
- The branch acquired software in 1990 enabling computer enhancement of magnetic and other geophysical survey data. The technique was piloted as part of mapping studies in the Brownell-Wapawekka Lakes area (Fig. 1, H).
- A study and review was made of gold deposits in the Glennie Domain (between La Ronge, Deschambault Lake and the southern tip of Reindeer Lake, Fig. 1, J).

Kimberlite (Diamond) Studies

A contract was issued for more petrographic and isotope studies into the Precambrian basement in southern Saskatchewan, based on samples collected in deep oil exploration wells (Universities of Regina and California, Santa Cruz). This information is of value in predicting the occurrence of kimberlitic (potentially diamond-bearing) pipes.

Precambrian Geodata

The regional geoscience databases include rock and mineral sample collections, and other files, which are now housed on microcomputer. These files are used in house and are also available on an increasing scale for consultation by industry and others. The Geochronology file was substantially upgraded and, together with the Precambrian bibliography database, was published and made available in digital form. Development of other files continued.

During 1990-91 most branch microcomputers were networked. In addition, a start was made into upgrading microcomputer systems for use with map and other graphic data, with the acquisition of geological map plotting software, three powerful portable computers for field use and other computerware.

Publications and Presentations

Published and open file reports are issued periodically, based on field programs, consultant's reports and in-house compilations.

Branch geologists contributed a major part of the Saskatchewan Geological Survey Open House presentation in November 1990 which was attended by mineral industry representatives from across Canada and the U.S.A. Presentations were also made at other meetings held in North America.

Sedimentary Geodata Branch

Industrial Minerals Section:

The section plans and conducts investigations concerning the industrial minerals resources of the province. These are generally published as departmental reports, open file reports or as contributions to the Summary of Investigations. The results of these investigations, together with various data bases in the branch, form the basis for assisting industry, other government agencies and the public in matters relating to industrial mineral resources and their potential for development. During the fiscal year considerable time was devoted to project planning in preparation for a renewal of the Canada-Saskatchewan Mineral Development Agreement.

In addition to routine resource investigations the section conducts special resource projects based on the level of current interest as determined by monitoring industry enquiries, new technology, changing markets and exploration trends in Saskatchewan and other provinces.

The section also reviews technical submissions by industry resulting from work conducted under the Quarrying Regulations, the Coal Disposition Regulations and the Subsurface Mineral Regulations. In addition, the section contributes to reviews of environmental impact assessments of proposed mineral development projects in the sedimentary basin. Substantial time was also devoted to background data compilation and planning for a geographic information system.

Several projects were conducted during the year with funding provided by the Mineral Industry Diversification Program and the Consolidated Fund:

- Building Stone Potential in the Creighton-Pelican Narrows Region of Saskatchewan (Open File Report 91-3).
- Saskatchewan brine resources investigation including digitization of the subsurface brine data base for sub-Duperow formations. The remaining brine data base digitizing is being sponsored by the Geological Survey of Canada under Energy and Mines direction and is expected to be completed in 1991.
- An investigation of anomalous geological conditions in the sedimentary basin and their implications for diamond and other precious gem occurrences.
- Geological modelling of the Willow Bunch-Wood Mountain coalfield.
- Sampling and characterization of the Red Deer River and Nipekamew silica sand deposits.
- A long term project aimed at digitizing the entire public domain gravity survey data base for the sedimentary basin.
- Compilation of industrial minerals data from the sedimentary basin for the Mineral Resource Map of Saskatchewan.

Fig. 1. - Precambrian Geology field projects under the Mineral Industry Diversification Program (MIDP), a component of the Canada-Saskatchewan Partnership Agreement on Mineral Development 1990-95. Letters show approximate location of projects described in text. The base map shows the geological domains or regions, some of which are mentioned in text.

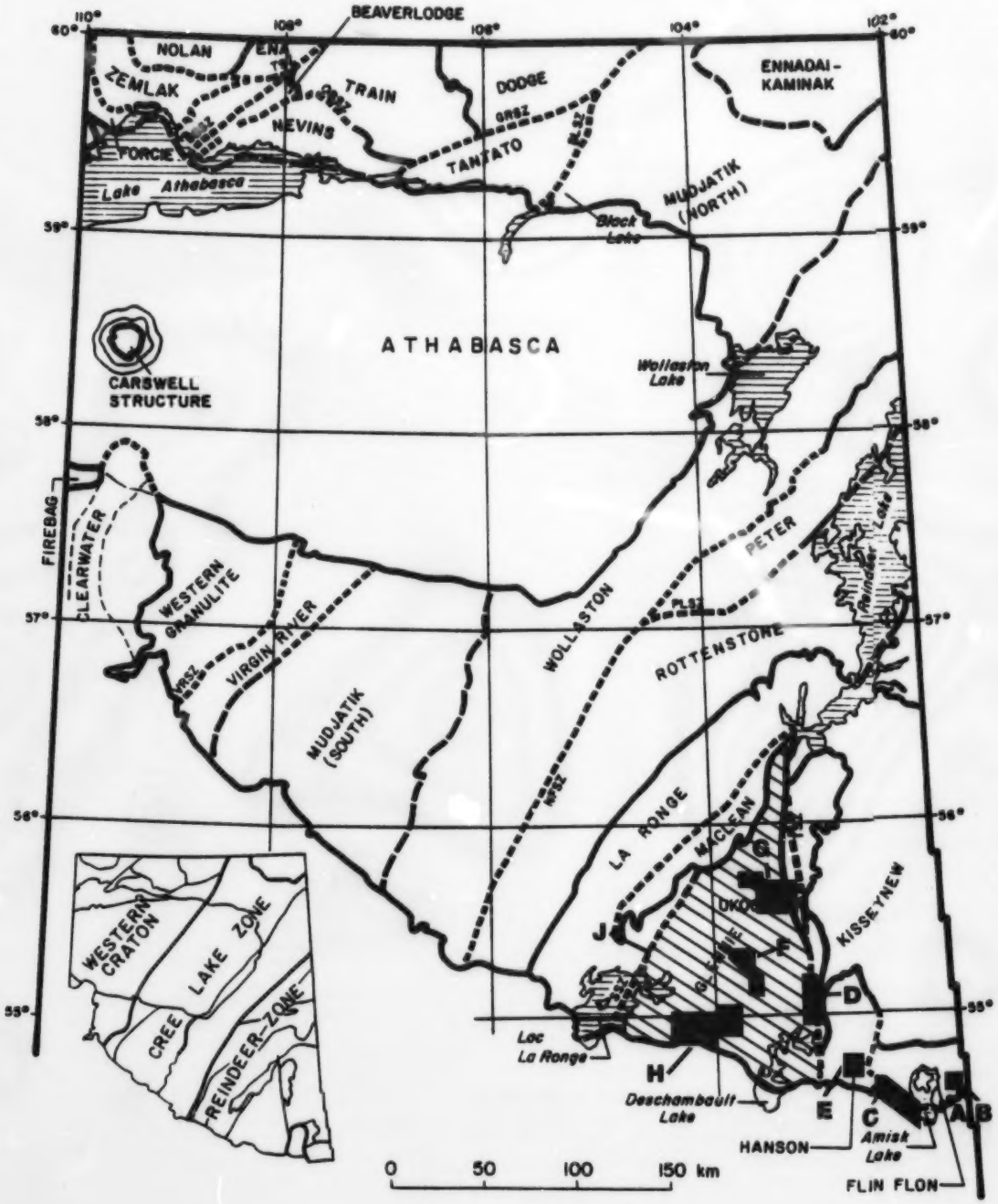
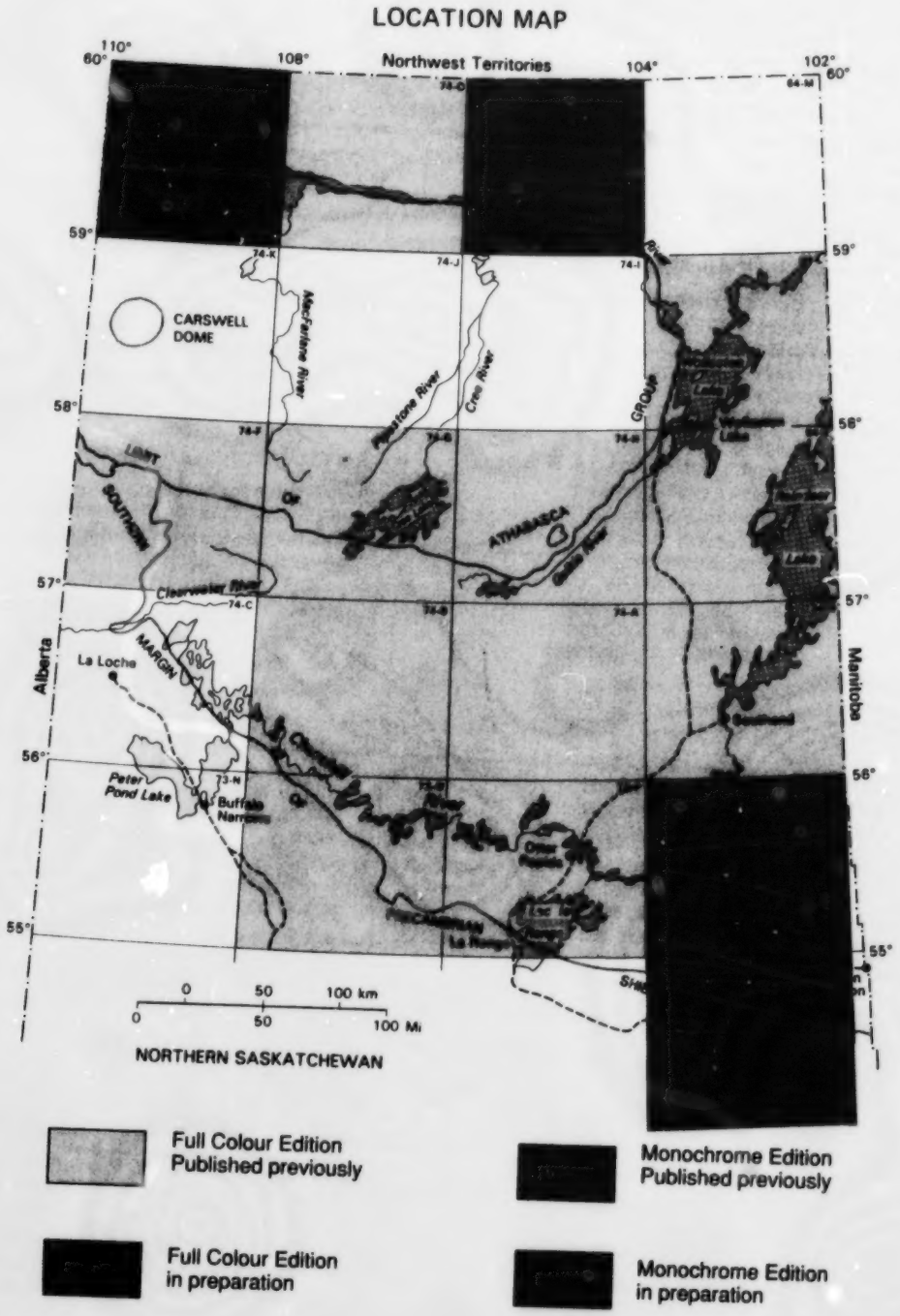


Fig. 2 - Precambrian Bedrock Compilation Geology Maps, 1:250,000 scale.



- Presentation of several papers, poster displays and talks at conferences in an effort to promote the province's industrial mineral potential.

The section handled about 220 major enquiries on industrial mineral resources, technology and markets, most of these from industry. The accompanying figure illustrates the distribution of enquiries by commodity or commodity group.

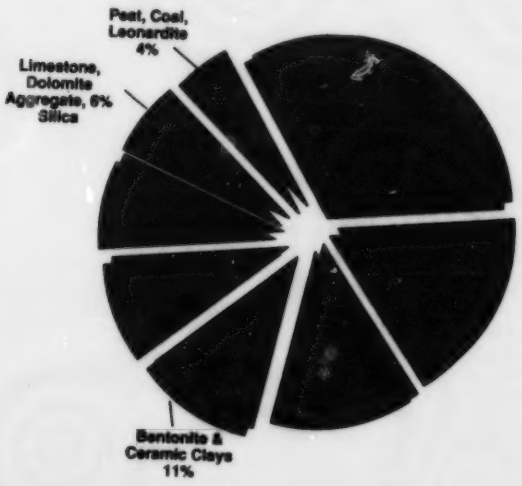
Interest in the diamond potential of Saskatchewan continued to be strong. Reports by industry of the discovery of several macro-diamonds will likely maintain the high level of interest and exploration activity demonstrated during the fiscal year.

Brine investigations by the section appear to be generating considerable interest in this resource. High values of calcium, magnesium, bromine and iodine, and the high productivity of some reservoirs provide optimism for the development of a new industry in the province.

Clay resources, including bentonite and kaolin, continue to attract a significant amount of attention from industry. The principal applications of interest for bentonites are in sealants for civil engineering projects, binders for animal feed, carriers for pesticides and drilling muds in the petroleum exploration industry. Opportunities for kaolin resources lie in filler for paper, paint, plastic and rubber, and as a raw material in synthetic zeolite production and ceramics.

Although stone quarrying is not yet one of Saskatchewan's industries the resource base is promising and world demand for unique stone continues to grow. Due to the inherent conservative nature of the industry a demonstration quarrying, processing and application project may be required to stimulate development.

Figure 3 - Distribution of Industrial Mineral Inquiries.



Well Records and Geophysical Data Section:

The section maintains a central repository of information from wells drilled under the Oil and Gas Conservation Regulations. Information is received, processed, entered into the on-line computerized system and filed. The section also receives and processes preliminary and final plans, monthly and final reports, and geophysical maps submitted by industry under the Sedimentary Basin Geophysical Exploration Regulations. The manual and computerized data files are the basis for servicing industry, government agencies and the public. The unit also compiles indexes of geophysical data for quarterly petroleum and natural gas land sales. During the fiscal year work continued on the computerization of the preliminary geophysical plan and the flowing shot hole files. Work was completed on the computerization of the gravity and magnetic maps index. Catalogs are now available for the seismic velocity surveys, structure test hole files, gravity and magnetic maps, and part of the seismic map inventory.

The principal statistics relating to the work of the section are summarized in the following table:

Well Files	**1990/91**
Data submission by industry	9,243
Files pulled	22,392
Photocopies for industry	31,667
New files set up	1,284
Letters requesting delinquent data	249
New wells coded and computerized	1,200
Supplementary data added to system	3,055
Well name changes	2,750
Geophysical Data	
Preliminary plan numbers issued	305
Final plans approved	269
Monthly reports processed	185
Geophysical maps reproduced for industry	747
Total seismic line kilometres recorded	11,003
Approximate total revenue generated by information services	$65,000

Petroleum Geology Branch

The Petroleum Geology Branch occupies the Subsurface Geological Laboratory Building at 201 Dewdney Avenue East, Regina and consists of a Geology Section and a Warehouse Section.

Geology Section

The major purpose of this group is to increase both the quantity and quality of geological information available to petroleum geologists and others interested in the sedimentary rocks of Saskatchewan. This is done by adding new information to, and upgrading information already in, the Well Information System; by undertaking geological research projects leading to published papers or reports; and by giving consultations on request to interested geologists.

Over the last year:

- Stratigraphic information was processed from 1,445 newly licensed wells and added to the Well Information System
- The stratigraphy of several hundred older wells was reviewed as part of the New Atlas studies and this information was used to upgrade the Well Information System.
- Two major projects continued:
  - Geology of the Medicine Hat Sand (Cretaceous) in Southeastern Saskatchewan.
  - Geology of the Interlake Group (Silurian) in Saskatchewan.
- One project was completed and published:
  - Report 217 - Stratigraphy of the Jurassic System in the Wapella-Moosomin Area, Southeastern Saskatchewan.
- Three minor projects continued as contributions to the New Geological Atlas of Western Canada:
  - Basal Clastic Slice
  - Ordovician and Silurian Carbonate Slice
  - Colorado Slice
- Two geological research projects were supported at University of Regina.
- Three professional papers and five poster displays were presented and/or published.
- Numerous consultations were given to industry geologists.
- Several workshops on Introductory Geology were arranged for schools (both student and teacher groups), for university students and interested members of the general public.

Warehouse Section

This group handles geological materials in the form of drill cuttings, cores and Precambrian field specimens. The material is processed and stored in the warehouse to be brought out for examination upon request by visiting geologists.

Over the last year:

- New cores were received from 362 wells for a yearly total of 5,506 boxes, bringing total number of boxes in storage to 289,463.
- New drill cutting samples were processed from 212 wells for a yearly total of 18,040 vials, bringing total number of vials in storage to 2,065,081.
- New drill cutting samples were processed for shipment to Energy, Mines and Resources Canada from 207 wells for a yearly total of 17,795 vials.
- Samples shipped to Energy, Mines and Resources Canada in Calgary totalled 22,700 vials from 307 wells.
- Cores examined on premises came from 1,803 wells for a total of 30,159 boxes.
- Samples examined on premises came from 335 wells for a total of 24,626 vials.
- Users of the Examination Facilities totalled 125. Of these, 107 were from industry and represented 78 companies, while 18 represented five (5) other organizations.
- Cores loaned out from the premises for study and/or analysis in other facilities came from 68 wells for a total of 744 boxes.
- Number of rock thin-sections, rock slabs and diamond polished sections prepared were 17, 318 and 15 respectively.

Mineral Development Branch

The branch is responsible for evaluating technical reports submitted as assessment work by the mineral industry under the Mineral Disposition Regulations 1986, and for maintenance of the historical exploration record represented by these reports. Also administered are the Saskatchewan Mineral Deposits Index and the offices of the resident geologists in La Ronge and Creighton. In addition, the branch undertakes geological studies of metallic mineral deposits and disseminates information about these, and about mineral industry activities and mineral development opportunities at both technical and general levels.

The yearly volume of assessment submissions provides an indication of the level of exploration activity, although it is not an absolute measure. A total of 1,429 submissions was received for claimed expenditures of $53.27 million (down eight per cent from 1989-90). These are broken down into specific exploration activities in Figure 4 and into regions in Figure 5.

A total of 136 new assessment files was incorporated into the historical record, 108 visitors were received and 157 requests for information handled.

All assessment file catalogue data are now computer filed and three new computer generated assessment catalogues, for the respective northern exploration areas, were published during the year.

Work continued on the Saskatchewan Mineral Deposits Index with documentation of new occurrences and updating of existing occurrences. Rationalization of the index led to a reduction in the total number of records to 2,407, through the elimination of low priority occurrences of iron sulphides. The index provides a primary reference for mineral exploration and land use planning. Requests for information totalled 22 and many of these were for the complete index on computer disc.

Figure 4 - 1990-91 Assessment Credits by Activity.

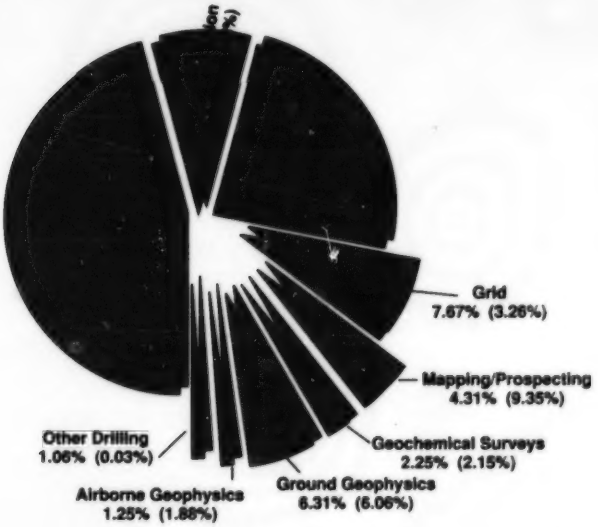
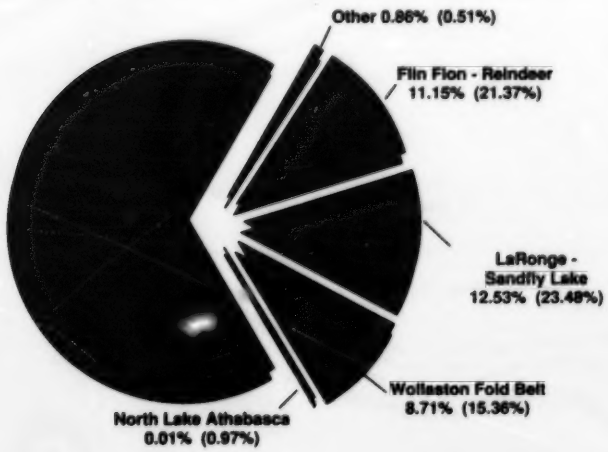


Figure 5 - 1990-91 Assessment Credits by Region.



The resident geologists, through offices in La Ronge and Creighton, monitor the mineral exploration industry in northern Saskatchewan and provide up-to-date information on exploration and mining activities and opportunities. In the current fiscal year, both resident geologists were headquartered in La Ronge and the Creighton office continued to be operated on a part-time basis. The La Ronge office maintains files of current mineral claims, topographic maps, airphotos, geological maps and reports, and assessment work submissions. The Creighton office has current claim maps and one of the resident geologists from La Ronge was available for consultation at specified times throughout the year. In the current fiscal year, an estimated 1,175 visitors were received at the resident geologists' offices. The 20 per cent reduction from last year reflects the current downward trend in mineral exploration activity in northern Saskatchewan.

Studies of metallic mineral deposits and their geological environments continued at a high level under the Mineral Industry Diversification Program. Specific projects targetted gold, base metals, uranium and rare metals (Figure 6).

In the La Ronge Gold Belt, investigations by branch staff continued in the Byers Fault area (Corner Lake and Tower Lake East deposits) and at the North Lake deposit. Contracts with the University of Waterloo allowed for structural and geochemical studies designed to improve models for gold exploration in the Star Lake area, where all of Saskatchewan's new gold mines are located. Ore reserves have been depleted at these mines, hence there is an immediate need for new discoveries to be made to support existing milling facilities. A contract with the University of Saskatchewan funded investigations at the Seabee gold deposit currently being readied for production in late 1991. A second contract with the University provided for stable and radiogenic isotope determinations to augment the various ongoing mineral deposit studies.

Branch staff continued a major bedrock mapping project south of Flin Flon, an area of high base metal exploration potential. They were also active in furthering new mapping begun last year at Hanson Lake, in proximity to the historic Western Nuclear lead-zinc mine and recently discovered McIlvenna Bay zinc-copper prospect.

A jointly funded uranium exploration industry, Saskatchewan Research Council, and Saskatchewan Energy and Mines project, ongoing since 1988-89, was completed by the Research Council. The project examined Wollaston Group stratigraphy in relation to the uranium deposits of the Athabasca Basin.

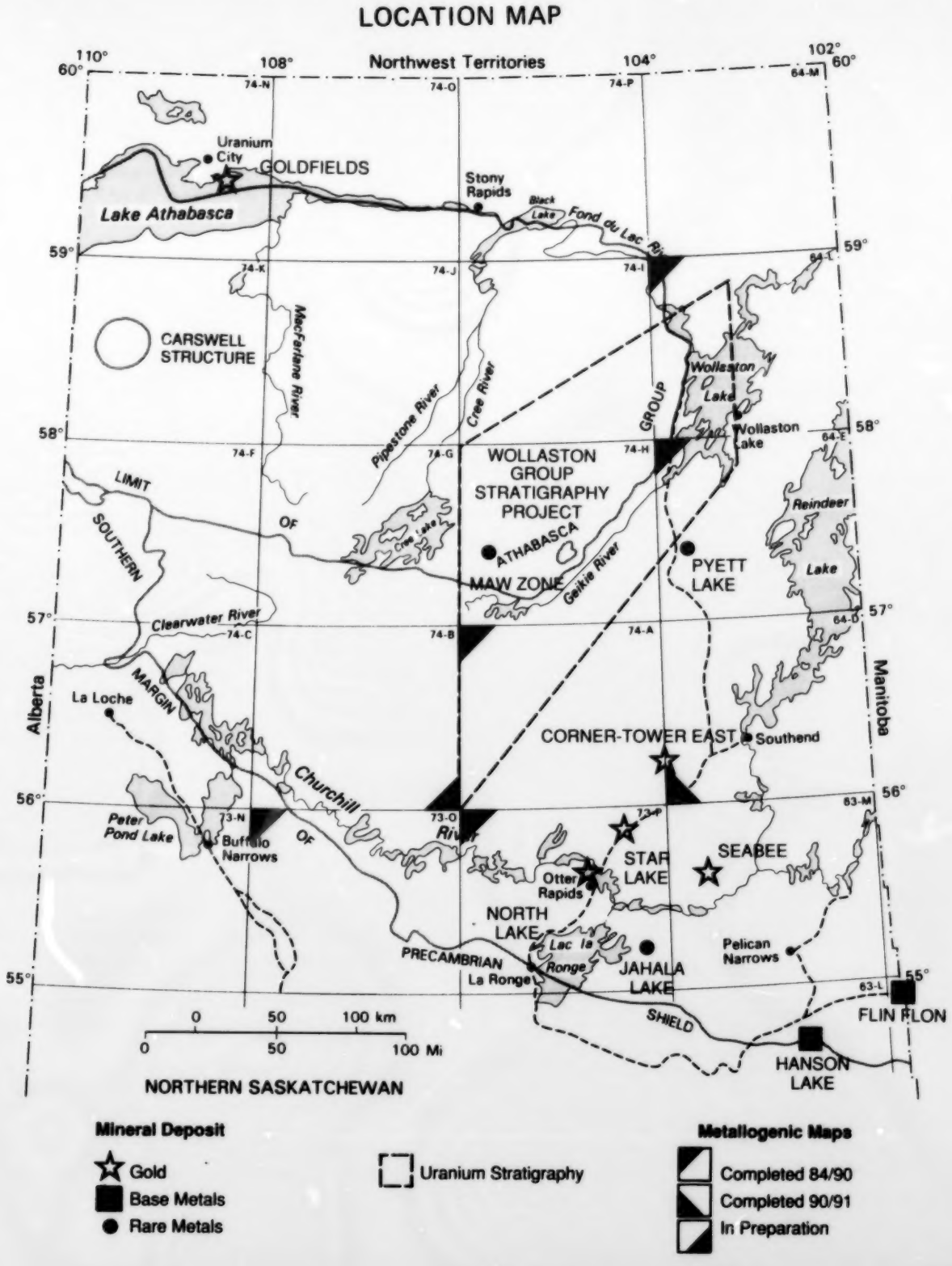
Occurrences of rare metals, including the Maw Zone rare earth metal prospect in sandstones of the Athabasca Basin, and various rare mineral pegmatites and granites in the crystalline shield rocks, were examined by branch staff and analysed geochemically to evaluate their economic potential.

Production of several high profile publications promoting Saskatchewan's mineral resources were coordinated by the branch including a new "Mineral Resource Map of Saskatchewan", and a summary report "Base Metals in Saskatchewan".

In addition, a variety of technical publications and oral presentations, and three university theses resulted from internal and contracted branch projects.

The mineralized core collection, stored in La Ronge and administered through the office of the resident geologists, received additions totalling some 3286

Figure 6 - Mineral Development Branch Projects.



metres from uranium deposits in the Athabasca Basin and from gold and base metal deposits in the La Ronge and Flin Flon regions. Some 74 people examined core from the collection or visited the core storage facility during the fiscal year. The La Ronge office also collected 300 metres of sedimentary cores from the Phanerozoic section south of Flin Flon.

The Prospectors' School traditionally run by branch staff in La Ronge was held in Creighton for the first time. The school, organized in conjunction with Northlands Career College and SIAST, graduated four northern residents.

The 1:250,000 scale metallogenic map series established in 1984-85 received ongoing attention. These maps provide details of location, metal association, development status and type of mineralization, as well as reference to information on all noted mineral occurrences. They augment a similar scale compilation bedrock geology series and provide a valuable reference for the mineral exploration industry. One new sheet (Reindeer Lake South 64D) was released in 1990-91 and a further sheet completed for editing by year end.

Mines Branch

This branch is responsible for the disposition, development and conservation of all Crown minerals with the exception of petroleum, natural gas, helium and oil shale. The activities of the branch are carried out through the Mining Lands Section and the Mines and Statistics Section.

Mining Lands Section

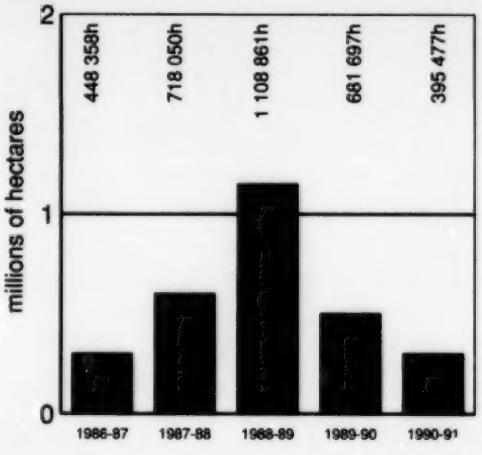
Mining Lands Section administers and disposes of Crown minerals under the following regulations:

- The Mineral Disposition Regulations, 1986 (uranium, base and precious metals, other minerals)
- The Quarrying Regulations, 1957 (sand, gravel, clay, bentonite and other quarriable substances); these regulations are currently under revision
- Alkali Mining Regulations (sodium sulphate)
- The Coal Mining Regulations, 1988 (coal)
- The Subsurface Mineral Regulations, 1960 (potash, salt)

Activities of the section are centered in Regina, with a field office maintained in La Ronge to permit local administration of regulations.

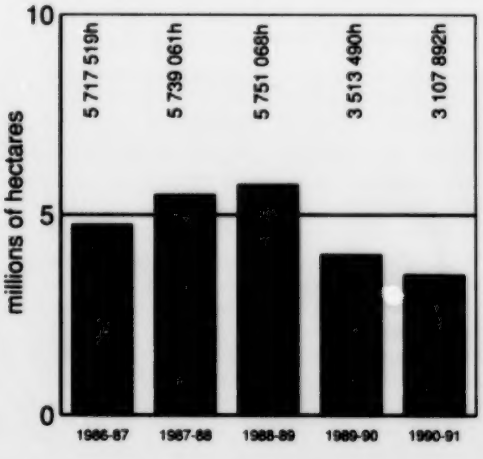
A total of 582 new mineral claims, covering 395 477 hectares, was issued during the year pursuant to The Mineral Disposition Regulations, 1986. Of the new claims staked, 54 per cent were staked in the Southern Mining District and covered 20 per cent of the area staked (Figure 7).

Fig. 7 - New areas acquired under claims and permits.



As of March 31, 1991, there were 2 450 738 hectares held under 4,150 mineral claims; 160 749 hectares held under 4 prospecting permits; and 496 405 hectares held under 235 leases for a total area of 3 107 892 hectares (Figure 8).

Fig. 8 - Total areas under disposition (claims, permits, leases).



In the year under review, 5 prospecting permits, covering 11 606 hectares, and 70 leases covering 2 040 hectares were issued under The Quarrying Regulations, 1957. At year end, 29 230 hectares were held under 16 prospecting permits and 23 558 hectares were held under 1,139 leases.

The Coal Disposition Regulations, 1988 came into effect in July 1988. One hundred and thirty-nine leases covering 12 345 hectares were issued, increasing the total hectares under coal lease to 136 198. No coal prospecting permits were issued,

however, 15 were surrendered, reducing the total number of permits to zero.

No alkali mining leases were issued during the year, leaving the total alkali dispositions held on March 31, 1991 at 36 leases covering 13 988 hectares. Four permits for the removal of sodium sulphate from Little Manitou Lake area have been issued to a total of 65,000 pounds.

Under The Subsurface Regulations, 1960, 10 potash leases exist, covering 213 045 hectares. Two permits were surrendered, reducing the area under potash permits to 50 205 hectares.

Mines and Mineral Statistics Section

The major functions of the section support the development and conservation of those minerals for which the branch has responsibility. In addition, the section is involved in environmental matters referred to the department. Specifically, the section performs the following functions:

- monitors mining developments and operations;
- maintains historical statistical data on production and sales of potash, uranium, coal, precious and base metals, sodium sulphate, salt and other industrial minerals, including quarriable materials;
- co-ordinates the department's reviews on, and corresponding responses to, project submissions referred by Saskatchewan Environment and Public Safety as part of the environmental impact assessment process and evaluates those project submissions pertaining to mining developments;
- assesses the operating variables and prepares royalty and economic forecasts for the precious and base metals sector of the industry; and
- provides technical advice and assistance related to mining in and outside the department, and applies certain sections of the regulations administered by the branch.

During the fiscal year, 29 mines, excluding quarries, were operating in the province. The 1990 excavation plans required from 17 of the mines were all acquired and accepted as part of the mining data base. The Jasper Operation, a joint venture gold mining project between Cameco and Shore Gold Fund, started production mining in March and poured the first gold bar in April. Jasper mine was visited as part of the monitoring task. Three potash mines started producing salt from their tailings as by-product of their operations, adding up to a total of five potash mines now in salt production.

The historical statistical records of production and value of sales were maintained for potash, uranium, coal, gold, sodium sulphate, bentonite, salt and sand, and gravel. Nine various forms of summary tables dealing with the statistics on mineral production were prepared and distributed monthly, quarterly or yearly, to approximately 570 users in and outside the department.

Computerization of historical production statistics for sodium, gold and other metallic minerals was started. Forty-one information requests on mineral statistics were handled.

A total of 111 environmental submissions were received from Saskatchewan Environment and Public Safety; of these, 23 pertained to mining projects. These projects were reviewed by the section staff with other reviewers and corresponding replies were prepared on the basis of which regulations administered by the branch apply to each project. Eight environmental meetings were attended and one environmental related report was completed.

A computerized recalculation of the Crown mineral lease for the area of eight operating potash mines was completed and survey plats were prepared. This information will form the data base for handling requests to amend potash lease areas and for royalty calculation utilizing the township concept.

Petroleum and Natural Gas Division

Bruce Wilson
Executive Director

The Petroleum and Natural Gas Division has major responsibilities in all areas related to provincial jurisdiction over oil and gas resources including disposition and management of Crown oil and gas rights; well licensing and surveillance of all exploration, development and production operations; oil and gas conservation including determination of reserves and producibility estimates; maintenance of production and disposition statistics; crude oil marketing; and royalty and tax legislation.

The responsibilities of the division are carried out through the operation of five branches:

- Petroleum Development Branch
- Engineering Services Branch
- Geology and Petroleum Lands Branch
- Economic and Fiscal Analysis Branch
- Petroleum Statistics Branch

The most notable event affecting the oil and gas industry in 1990 was the Iraqi invasion of Kuwait. For a brief period of time late last year oil prices rose significantly. Unfortunately, the short term nature of the price increase did little to alter investment levels. Weakness in natural gas prices during early 1991 provided further evidence of the very volatile pricing environment facing the oil and gas industry.

A total of 1,379 wells were drilled during 1990 compared with 1,498 drilled in the previous year. There were 607 oil well completions and 531 gas well completions in 1990. This compares with 365 oil well completions and 960 gas well completions in 1989. Oil well drilling showed some recovery while gas well drilling dropped from the record level established the previous year.

Sales of Crown petroleum and natural gas rights for 1990 were $32.5 million down slightly from the $36.3 million received in 1989. Approximately 25 per cent of the bonus bid revenues received in 1990 were for gas prone lands compared with 58 per cent a year earlier. A total of 1.6 million acres of Crown oil and gas rights were sold during 1990 representing a 30 per cent reduction from the previous year.

Crude oil production for 1990 increased marginally to 12.2 million cubic metres. Higher productivity horizontal and deep oil wells are credited for the increase in production. Production of non-associated natural gas continued its upward trend reaching an estimated 6.1 billion cubic metres. This represents an increase of 13 per cent above the 1989 production level.

Horizontal drilling came of age in the province during 1990 with 77 horizontal oil wells drilled. There were 13 horizontal wells drilled in 1989, three in 1988 and one (the first) in 1987. Most of these horizontal wells have been drilled in the northwest (heavy) and southeast (light and medium) areas of the province.

Certain deficiencies in the province's legislative authority to approve horizontal wells were identified as a result of a legal dispute over a horizontal well in southeast Saskatchewan last year. The uncertainty created by this incident delayed the approval of several wells. Amendments to The Oil and Gas Conservation Act were proposed for the spring 1991 session to fully address the requirements of this new technology.

The NewGrade heavy oil upgrader in Regina overcame its start-up problems and operated near capacity for most of the past year. Steady progress was made on construction of the Bi-Provincial upgrader at Lloydminster. Commissioning of the facility is to begin in mid-1992.

Petroleum Development Branch

The Petroleum Development Branch is primarily responsible for ensuring that the field operations of the province's oil and gas industry meet acceptable technical and environmental protection standards, that well licensing proceeds in accordance with regulations established under The Oil and Gas Conservation Act and that geophysical activities occur in accordance with The Sedimentary Basin Geophysical Exploration Regulations.

The Regina staff:

- directs field office operations;
- processes and approves applications for well drilling licences;
- enters initial data for the Well Information System;
- maintains records on drilling activity;
- processes and approves well ownership and name changes;
- advises of offset drilling commitments on Crown land;
- processes weekly drilling reports and compiles statistical data relating to drilling activity;
- represents the department on oil spill co-operatives;
- processes and approves applications for Geophysical Licences, Crew Certificates and Blasters Permits;
- assists on special projects such as the Rafferty/Alameda Dams Project and the Great Sand Hills Land Use Strategy.

The field office staff:

- collects and compiles drilling, completion and reservoir data;
- enforces regulations, orders and policies pertaining to pollution control in the oil and gas industry;
- checks standards, procedures and equipment used by industry in drilling, producing and abandonment of wells;
- witnesses production tests;
- performs on-site inspections of all wells and facilities;
- investigates and assists in resolving landowner problems associated with the use of land for geophysical activity, exploration and production; and

- investigates, reports and ensures that industry act promptly and efficiently in handling oil and salt water spills.

Regina staff continue to upgrade the Well Information System as well as add new well licences and associated drilling information. They are also responsible for the maintenance of up-to-date wall maps which give such information as well type, completed horizon and pool boundaries. Industry, the general public and various department personnel make extensive use of the maps. Similar maps are maintained by each of the four field offices for their specific areas, and are also used by industry and the general public.

In addition to issuance of drilling licences mentioned under the Drilling Activity heading, the branch also called 141 offset commitments on Crown lands. Offsets are created by freehold mineral wells being placed on production adjacent to Crown land. Seismic and logging crew numbers increased slightly. This year staff issued 61 geophysical licences, 112 crew certificates and 234 blaster permits. Well ownership changes were registered on 4,812 wells with name changes being made on 2,424 wells. A large number of inquiries continue to be handled regarding drainage units, target areas and the requirements necessary when drilling, producing and abandoning oil or gas wells in the province. The director of the branch represented the department in numerous meetings in the preparation of a Great Sand Hills Land Use Strategy.

Environmental surveillance is ongoing with field staff conducting numerous inspections. During the year in excess of 32,000 inspections were carried out on well, battery and rig sites; clean-up was monitored on 408 oil and salt water spill sites; 1147 well annulus inspections were witnessed and 41 landowner-related complaints were resolved.

Field staff also inspected, acquired and reported on all of the drilling, completion and abandonment activity, carried out 600 gas meter inspections and witnessed 542 production test audits. The environmental fund was used by the department to undertake the work on the abandonment and surface restoration on nine wells where companies had gone into receivership.

Drilling Activity

Drilling activity in 1990 decreased in comparison with 1989 activity. The decrease was all the result of less gas well drilling. Oil well drilling, however, showed a marked increase from 365 in 1989 to 607 in 1990.

A total of 1,379 oil, gas, service and dry holes were drilled during 1990. This activity is broken down as follows: 607 oil wells, 531 gas wells, 31 service wells and 210 abandoned dry holes. Overall this results in a 85 per cent success rate. Figures 9 and 10 give a breakdown by area of the respective numbers of wells and meterage drilled. Well licensing totalled 1,463 compared to 1,524 in 1989.

Figure 9
Metres Drilled by Area

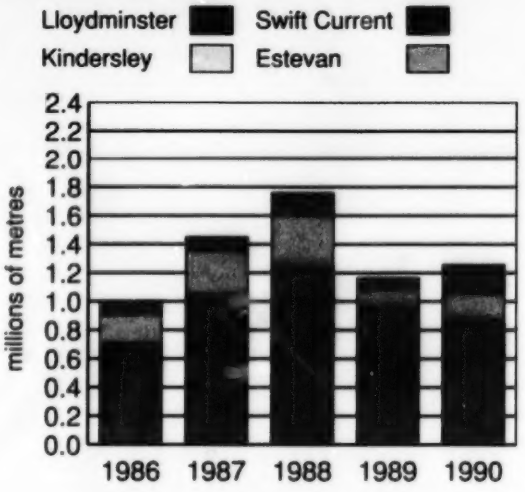
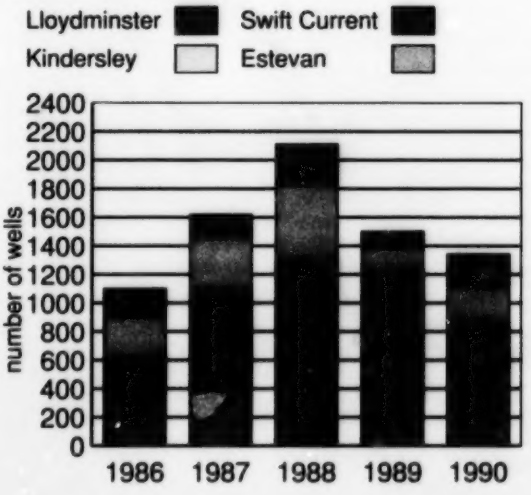


Figure 10
Wells Drilled by Area



Engineering Services Branch

The Engineering Services Branch evaluates Saskatchewan's crude oil and natural gas reservoirs to ensure that exploration, development and production of these resources follow good conservation and engineering standards. Sound management of these resources is essential to achieve efficient production and ensure maximum benefits from development. The mandate for these responsibilities comes from The Oil and Gas Conservation Act, The Crown Minerals Act, The Pipe Lines Act and respective regulations.

Specifically this branch:

- determines crude oil and natural gas reserves for use by industry and government in planning and developing policies;
- evaluates industry applications for enhanced oil recovery projects, horizontal drilling projects, waste water disposal wells, off-target wells and other proposals and participates in public inquiries held to consider these applications;
- assesses unitization proposals to ensure that Crown lands receive fair and equitable unit participation;
- evaluates industry submissions for incremental oil production from waterflood and enhanced oil recovery projects to establish reduction to Crown royalties and freehold production taxes;
- establishes pool boundaries, well spacing and target areas to facilitate orderly crude oil and natural gas development;
- issues maximum permissive production rates for oil wells and daily allowables for gas wells, and monitors production to ensure that these rates are not exceeded;
- issues construction and operating permits for oil and natural gas pipelines and witnesses pressure tests conducted to ensure that pipelines meet operating standards;
- prepares for publication, pertinent engineering, development and production data for oil and natural gas pools, including monthly demand for Saskatchewan crude oil;
- monitors crude oil markets and tabulates nominations for crude oil; and
- provides technical expertise and assistance to other branches and divisions in the department.

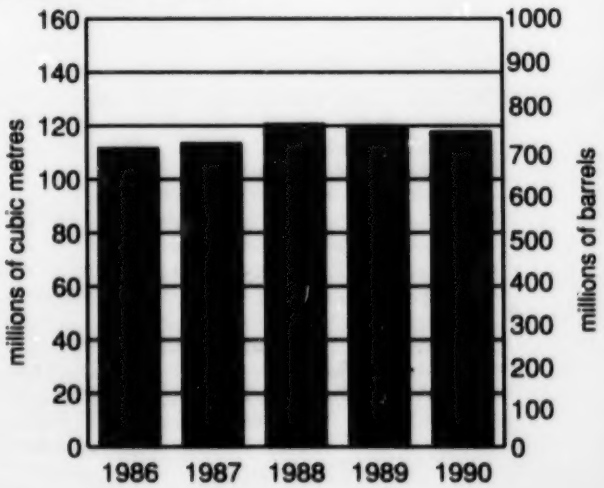
Highlights

- Seventy-seven additional horizontal wells were drilled in the province in 1990 following the successful drilling and completion of Saskatchewan's first horizontal well by Sceptre Resources Limited in the Tangleflags area in 1987. Three horizontal wells were drilled in the province in 1988 and 13 in 1989.
- The deregulation of natural gas markets and prices in the province in 1987 prompted unprecedented gas exploration and development activity which resulted in the drilling of 531 successful gas wells in 1990. This follows an all time gas well drilling record in the province in 1989 of 960 wells exceeding the previous records of 742 wells in 1988 and 568 wells in 1987.
- Eleven new units and unit expansions were approved in 1990 to accommodate new or expanded waterflood projects. Thirty two waterfloods and modifications were approved in 1990.

Crude Oil Reserves

- Saskatchewan's remaining established crude oil reserves have decreased by an estimated 1.5 million cubic metres to 117.8 million cubic metres in 1990. This is the net result of an increase in initial reserves of 10.7 million cubic metres and production of 12.2. This reserve decrease is largely attributed to the lack of significant drilling or enhanced recovery activity.
- The department estimates that the potential enhanced oil recovery reserves are 667 million cubic metres with 89 per cent of these reserves classified as heavy oil.
- These potential reserves are an indication of the oil that can be recovered assuming that enhanced oil recovery techniques are successfully applied. Considerable technical risk currently exists requiring further research and experimentation.

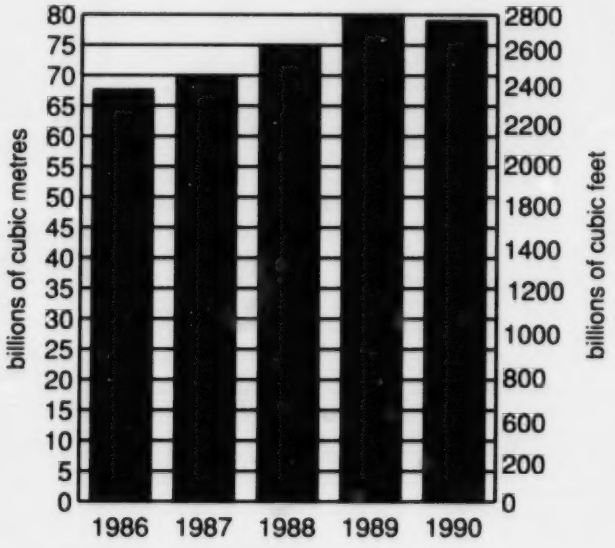
Figure 11
Remaining Oil Reserves



Natural Gas Reserves

- Saskatchewan's remaining established natural gas reserves decreased by an estimated 0.8 billion cubic metres to 79.0 billion cubic metres in 1990. This is the net result of an increase in initial reserves of 5.4 billion cubic metres less production for sales of 6.2 billion cubic metres.
- The department estimates that the remaining ultimate potential which includes established reserves could reach 175 billion cubic metres. Additional exploration and development is required for better evaluation.

Figure 12
Remaining Gas Reserves



Crude Oil Production

- Oil production in 1990 was 12.2 million cubic metres compared to 11.7 million cubic metres in the previous year. This slight increase was the result of higher drilling activity, particularly horizontal wells. On average, there was minimal shut-in of production due to marketing difficulties and pipeline capacity in 1990.
- Saskatchewan's oil production is made up of different qualities of crude commonly identified as light, medium and heavy found in different geological zones and geographical areas. In 1990, approximately 30.7 per cent was heavy oil, 35.1 per cent was medium and 34.2 per cent was light.

Figure 13
Crude Oil Production

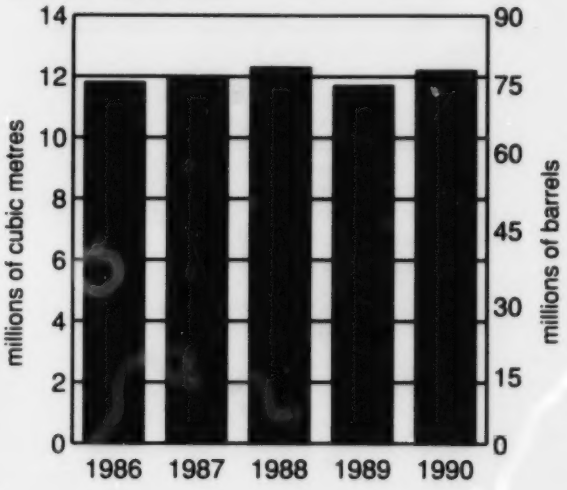
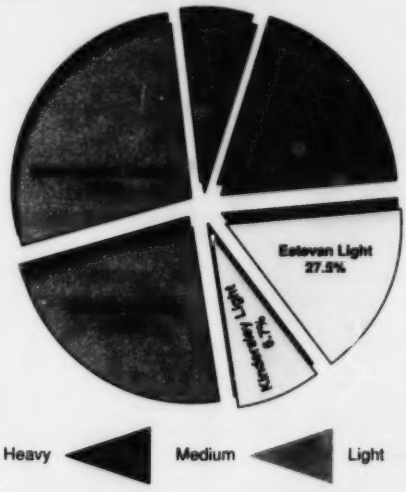


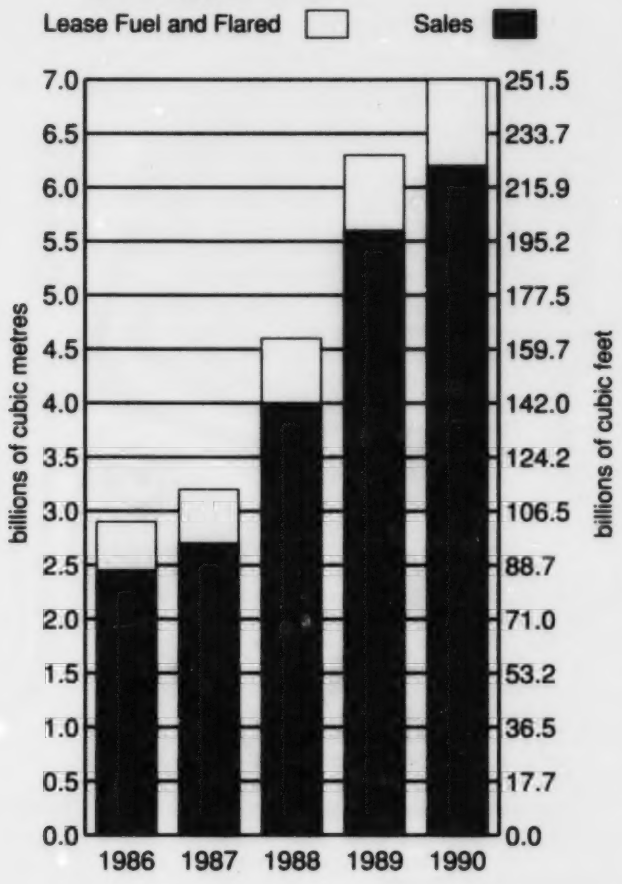
Figure 14
Quality of Saskatchewan Crude Oil Production by Area for Calendar Year 1990



Natural Gas Production

Natural gas production in 1990 was 7.0 billion cubic metres, an increase of 13.0 per cent from the previous year when it was 6.2 billion cubic metres. Sales of the province's natural gas were 6.2 billion cubic metres with the remainder of the production used for lease fuel or flared. Approximately 3.8 billion cubic metres of natural gas were exported from the province in 1990. Natural gas production will progressively increase because of better access to the export market as a result of deregulation. This will allow the province's shut-in reserves to be developed and produced as well as causing further exploration.

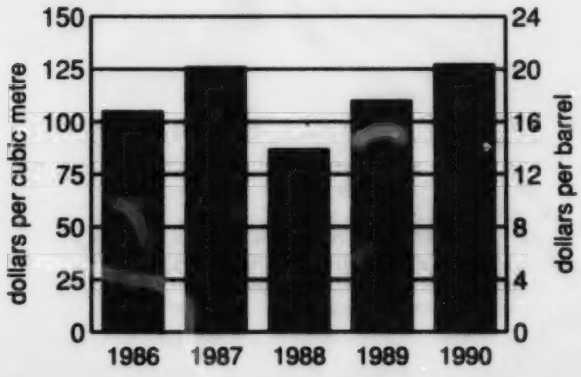
Figure 15
Natural Gas Production



Average Crude Oil Prices

The average 1990 Saskatchewan crude oil price of $127.26 per cubic metre represents a 19 per cent increase over the $107.10 per cubic metre average for 1989. This increase follows the trend in world oil prices over that time period.

Figure 16
Average Crude Oil Prices



Geology and Petroleum Lands Branch

Geological Mapping and Land Evaluation Section

This section has two principal responsibilities: geological mapping and land evaluation.

Geological Mapping Unit

Geological maps (mainly structure contour maps) are drawn and maintained for all oil and gas producing areas in the province. The maps are used for land evaluation, for reserve calculations in the Engineering Services Branch and in helping solve problems related to the producing areas. At the end of the fiscal year, 125 pool structure contour maps were being maintained. A program of updating 40 regional structure maps was also initiated. The maps may be purchased from the department's Marketing and Publications Branch.

In carrying out their mapping work, geologists acquire a detailed knowledge of the geology of the producing oil and gas pools. This expertise is put to use within the Petroleum and Natural Gas Division when staff members are asked to make recommendations on submissions from industry or in dealing with other administrative matters.

Industry submissions in the reporting period included applications for pressure maintenance of producing units, conversion of wells to salt water disposal, and secondary recovery of oil by waterflood. As well, requests were received for permission to drill wells outside the approved spacing pattern and for abnormal well spacing patterns.

This work unit undertook a joint study along with Manitoba Energy and Mines and the North Dakota Geological Survey on the Bakken Formation petroleum potential in the Williston Basin. The results of this study will be presented at the Sixth International Williston Basin Symposium to be held in Regina in October, 1991.

New land tenure regulations were ratified which will deal with lease continuance for leases in heavy oil areas of the province where economic recovery of reserves is not possible using today's technologies. The regulations will also encourage the development of new enhanced oil recovery (EOR) techniques in these areas.

Information and advice were made available to other branches, departments and the general public on requests ranging from the interpretation of the economic geology of known oil and gas accumulations to the hydrocarbon potential of unexplored prospects.

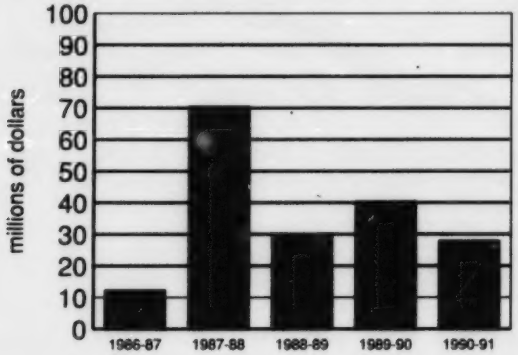
Land Evaluation Unit

The economic potential of hydrocarbon resources underlying specific areas of the province is determined as required by the department. Monetary evaluations of reserves are primarily for land sales. As well, this unit:

- reviews and recommends requests from industry for the posting of specific Crown mineral lands at department land sales;
- prepares sales notices and technical data for sales;
- reviews and recommends acceptance or rejection of bonus bids received from industry on posted lands;
- evaluates and selects Crown acreage in drilling reservations when such reservations go to lease;
- administers net royalty leases and inspects non-unit net royalty leases and farmouts to ensure compliance with the terms or agreements made with the department;
- reviews requests for waiver of offset well commitments on leases adjoining certain freehold lands producing oil or gas and makes follow-up recommendations;
- advises industry and the general public concerning the value of mineral rights for specific areas.

Four sales of Crown petroleum and natural gas rights were held during the 1990-91 fiscal year. Revenues totalled $27,904,360.72. This compares to $40,371,020.31 received during the previous fiscal year. Dispositions of mineral rights in the 1990-91 fiscal year totalled 342,389 hectares (846,062 acres) consisting of 36 permits containing 173,472 hectares (428,658 acres), eight drilling reservations comprising 18,413 hectares (45,499 acres), and 908 lease parcels consisting of 150,504 hectares (371,905 acres). Revenue derived from the sale of petroleum and natural gas rights for the past five years is shown in Figure 17.

Figure 17
Revenue Received from Sales of Crown Petroleum and Natural Gas Rights.



Petroleum Lands Section

This section has three principal responsibilities: disposition administration, disposition review and registration.

Disposition Administration

This responsibility involves the administration and disposition of approximately 5.2 million hectares (13.0 million acres) of Crown mineral lands under The Petroleum and Natural Gas Regulations, 1969; The Helium and Associated Gases Regulations, 1964; The Oil Shale Regulations, 1964; The Crown Minerals Act, and The Oil and Gas Conservation Act.

The number of petroleum and natural gas permits under disposition increased from 187 at April 1, 1990 to 191 at March 31, 1991 with a decrease in area from 1,639,985 hectares (4,052,492 acres) to 1,620,050 hectares (4,003,230 acres). Drilling reservations under disposition decreased in the same period from 20 to 11 with a decrease in area from 42,771 hectares (105,690 acres) to 19,541 hectares (48,288 acres). Petroleum and natural gas leases in effect increased from 11,529 at April 1, 1990 to 11,551 at March 31, 1991. Area under lease totalled 3,168,168 hectares (7,828,715 acres). Dispositions under helium leases increased from 10 to 11 with an increase in area from 25,360 hectares (62,667 acres) to 25,619 hectares (63,307 acres) at March 31, 1991. Helium permits decreased from to 21 to 11 with a decrease in area from 566,431 hectares (1,399,682 acres) to 322,817 hectares (797,699 acres) at March 31, 1991. The number of oil shale permits remained constant at three covering an area of 52,059 hectares (128,640 acres). A total of 11 gas storage agreements were in effect totalling an area of 39,235 hectares (96,953 acres).

Disposition Review

All expiring petroleum and natural gas dispositions are reviewed annually to establish whether they will remain active for another year. A total of 6,835 dispositions were subject to review in March, 1991 which represents an increase of approximately 332 dispositions from the 6,503 reviewed in March, 1990.

Registration

This responsibility involves the monitoring, recording and registering of transactions directly affecting all dispositions through transfers, amalgamations, encumbrances or securities.

A monthly average of 380 transactions occurred in 1991 which represents a 28 per cent decrease from the monthly average of 528 in the previous year. The number of transactions affecting dispositions decreased from 6,330 at April, 1990 to 3,114 at March, 1991. Searches decreased from 3,740 at April, 1990 to 3,600 at March, 1991. The highest monthly total for searches in the fiscal year was 454 in the month of July. The monthly average of searches decreased from 311 in the previous year to 300 ending March, 1991.

Economic and Fiscal Analysis Branch

The Economic and Fiscal Analysis Branch evaluates, designs and implements Crown royalty and freehold production tax systems and exploration/development incentive systems to maximize provincial oil and gas revenues while maintaining an active oil and gas industry. In addition, the branch provides production, revenue, expenditure and employment forecasts related to oil and gas operations in the province and performs monitoring functions to assure industry compliance in reporting accurate price and production data.

Functionally, the branch is divided into the Fiscal Analysis/Monitoring Section and the Economic/Incentive Section.

Fiscal Analysis/Monitoring Section

This section is responsible for the implementation of appropriate crude oil and natural gas Crown royalty and freehold production tax regimes cited within The Petroleum and Natural Gas Regulations, 1969 and The Freehold Oil and Gas Production Tax Regulations, 1983; the preparation of oil activity forecasts and responses; and the monitoring of oil and gas price/production data. More specifically this section:

- analyses, develops and proposes royalty and tax systems for oil and gas produced by using conventional methods, by using enhanced oil recovery schemes (e.g. waterfloods, steamfloods, carbon dioxide) and by using new drilling techniques (e.g. horizontal);
- monitors and forecasts crude oil prices, oil production, government oil revenues and related provincial oil expenditures and employment;
- determines and issues monthly royalty/tax factors in response to changing oil and gas prices;
- performs detailed monitoring procedures to ensure the province is receiving a fair price for the royalty/tax share of oil and gas production in the province and to ensure the royalty/tax share is accurately determined;
- analyses the impact of changes, (e.g. world prices, exchange rates) that affect oil and gas activity in the province and surrounding jurisdictions;
- provides analytical assistance pertaining to upgrader negotiations and consumer gasoline inquiries;
- monitors revenue sharing between governments and industry;
- prepares submissions to boards, commissions and other external bodies on future crude oil supplies;
- prepares information circulars, directives and notices to keep industry informed of legislative and regulatory changes;
- performs the necessary consultation process with industry and other departments regarding policy changes; and
- prepares Cabinet documents pertaining to fiscal changes cited within the regulations.

Due to the Iraq/Kuwait Middle East crisis, world oil prices in 1990 experienced dramatic swings within a range of approximately $17.00/bbl (U.S.) to $36.00/bbl (U.S.). This oil price volatility resulted in 10 separate amendments being made to the royalty/tax levels in accordance with the price sensitive policies established in 1986.

Other major fiscal changes reviewed in 1990 pertain to the method of calculating royalty/tax liabilities in units and a new royalty/tax system for horizontal wells. Effective January 1, 1991, the average well productivity concept previously used in units to determine the royalty/tax rates that apply to the oil and gas production was replaced with a stand-alone producing well concept. Also an industry-department task force committee was formed to develop and analyse options on fiscal and regulatory policies applicable to horizontal wells. The task force was targeted to be completed in early 1991. A total of 77 horizontal wells were drilled (three abandoned) in Saskatchewan oil fields during 1990.

Economic/Incentive Section

This section is responsible for implementing incentive programs required to promote increased activity and production in the province, and for monitoring the cost effectiveness of incentive programs to ensure maximum benefits to the province and a positive climate for industry. The major duties of this section include the following:

- evaluate the economics of crude oil and natural gas exploration, development and production under varying federal and provincial fiscal arrangements;
- analyse, develop and monitor incentive systems to increase recovery of production;
- evaluate and make recommendations to encourage continued operation of old oil wells;
- evaluate and make recommendations on acceptable bonus bid offers to convert net royalty leases to standard Crown leases to enhance production and revenues;
- determine the initial holiday status of wells as noted on the "Application for Licence to Drill a Well";
- review and make recommendations regarding holiday extensions due to marketing restrictions or other exceptional circumstances;
- monitor and maintain an exploration and development expenditure base and an operating cost base;
- conduct economic and engineering analyses on special oil and gas issues, wells and/or projects;
- prepare information letters and policy directives;

- prepare monthly crude oil reports; and
- prepare Cabinet documents pertaining to incentive changes or revisions cited within the regulations.

In 1990 regulation amendments were made to implement a phase-down of the 24 month royalty/tax holiday period to a 12 month holiday period for special development wells. This phase-down was initiated in 1991 for new non-heavy oil wells and will be initiated in 1992 for new heavy oil wells. The industry was notified of this phase-down in June, 1990.

A total of 730 wells were drilled in Saskatchewan in 1990 for the purposes of finding oil. The overall success ratio was approximately 83 per cent with 123 wells being abandoned. The remaining 607 successful wells were categorized as follows:

56 conventional infill wells
(one year royalty/tax holiday);

344 conventional special development wells
(two year royalty/tax holiday);

14 conventional non-deep exploratory wells
(three year royalty/tax holiday;

21 conventional deep development wells
(three year royalty/tax holiday);

6 conventional deep exploratory wells
(five year royalty/tax holiday);

16 conventional development wells
(no royalty/tax holiday);

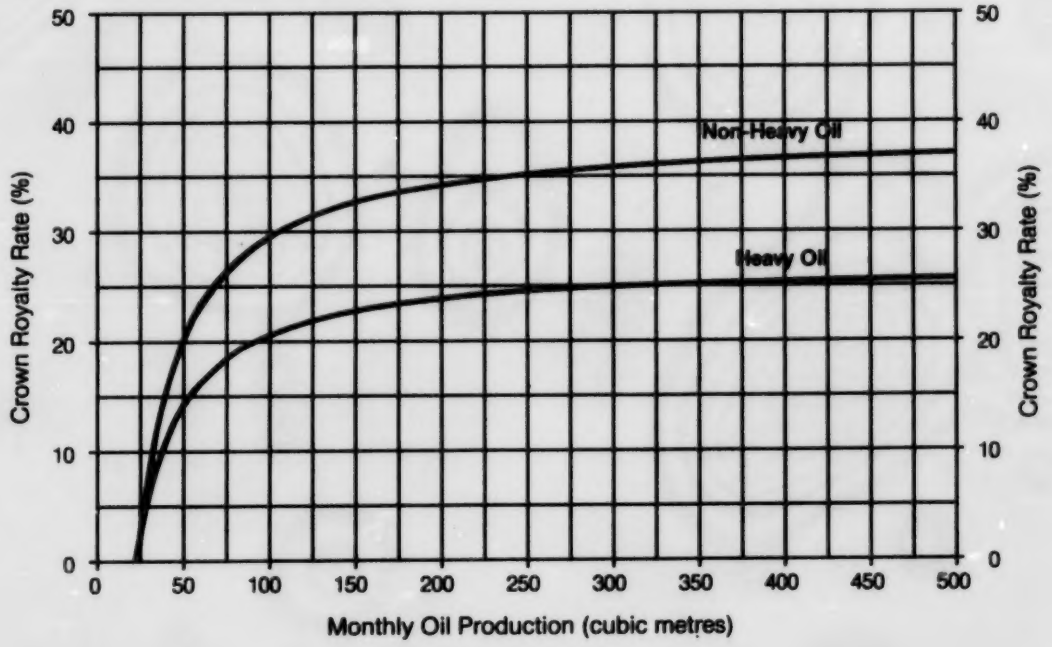
76 enhanced oil recovery project wells;

74 horizontal wells.

During the year a number of specific royalty/tax applications and requests were received from industry. Under the Workover Incentive Program, applications were analysed to encourage production to be maintained or improved from marginal oil wells. Under the net royalty lease conversion provisions, four net royalty leases were converted to standard Crown leases in exchange for appropriate bonus bids (approximately $1,000,000 in total). Also many individual company requests were reviewed pertaining to the administration of the royalty/tax holiday periods.

The deadline for industry applications to receive outstanding incentive balances under The Approved Expenditure Grant Program was February 28, 1991. Under special provisions a company was able to file for a credit against land sale bonus bids or royalty/taxes paid during 1987 and 1988. In total these special provisions allowed 242 companies to receive credits and reduced the outstanding incentive balance by almost 100 per cent.

Figure 18
October, 1990 Conventional Crude Oil Royalty Curves For New Developments



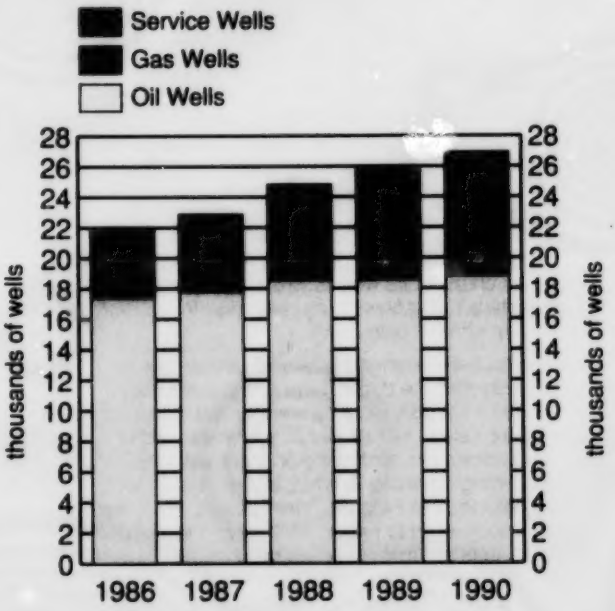
Petroleum Statistics Branch

The Petroleum Statistics Branch is responsible for the collection, processing and management of statistical data on the production and disposition of petroleum resources in the province in accordance with the regulatory requirements of The Oil and Gas Conservation Act and regulations thereunder, for the maintenance and efficient operation of computerized data processing and storage systems, for the administration of the Production Monitoring/Testing /Auditing Program, for monitoring and evaluation of wellhead oil and gas prices and transportation costs, and for providing statistical services to both internal and external users.

In particular, the branch:

- collects, validates, processes and records statistical data on the production and disposition of crude oil, natural gas, water and other products associated with oil and gas field operation;
- maintains, develops and implements appropriate modifications and enhancements to existing computer systems as well as designs and develops new systems to meet new policy initiatives;
- participates in a joint review process with other western producing provinces and industry task force committees on the development and standardization of all industry reporting forms, procedures and requirements;
- administers and co-ordinates activities of the Production Monitoring/Testing/Auditing Program to ensure proper and accurate measurement and allocation of production among wells tied to a common producing facility with primary emphasis on wells receiving royalty/tax incentives;
- reviews, establishes and informs industry of the appropriate royalty/tax status and length and commencement date of incentive period of new wells/units as well as maintains and updates the status of existing wells/units;
- monitors, analyses and evaluates posted terminal prices and reported wellhead prices of Saskatchewan crude oil and natural gas and the delivered price of that oil and gas to specific markets;
- monitors and investigates oil and gas production and disposition reporting practices to ensure compliance and to provide assistance and interpretation to industry with regard to regulatory requirements;
- reviews, analyses and evaluates pipeline tariffs and trucking costs and its economic impact on provincial royalty/tax revenues;
- monitors, researches and compiles statistical information pertaining to the marketing of Saskatchewan crude oil and natural gas production;
- monitors, assesses and establishes the quality of Saskatchewan crude oil production on an individual well, battery and pool basis;
- prepares for publication various weekly, monthly and yearly statistical reports on the production and disposition of petroleum and mineral resources;
- provides statistical services to petroleum industry, federal and provincial government bodies, consulting firms, universities and the general public.

Figure 19
Wells Capable of Production



The number of wells capable of production is an accurate indication of the volume of statistics that must be collected, processed and managed by the branch each month. During the past year, another net addition of 1,174 wells was realized bringing the number of wells capable of production to 26,935 in the province.

Petroleum statistics are made available in three periodic reports. The Drilling Activity Report summarizes the current status of wells being drilled and any changes in the status of existing wells. The Monthly Oil and Gas Production Report details by production and disposition areas the production of oil, gas and water for units and pools. The Mineral Statistics Yearbook brings together all the information on the production, disposition, value of disposition and provincial revenues from each of the fuel, industrial and metallic minerals. Also included in the Yearbook is a summary of drilling statistics and Crown land disposition on a monthly, yearly and all-time basis. Upon request, statistics are also provided in a variety of formats and on magnetic tape, microfiche, diskette or printout.

During the fiscal year, the branch continued to devote much of its resources to the development and acceptance testing of the new automated Production and Disposition System (PDS) to replace the existing system that was developed in the late 60's and to prepare the system to meet the department's long term goals for data integration. By fiscal year end, all critical components of the detail system design and system software development and testing for the processing of industry data have been completed and were operational. The remaining components of the PDS system involving retrieval and monitoring programs are at various stages of development and testing.

The implementation of a new royalty/tax calculation method for oil and gas production from units effective January 1, 1991 necessitated significant modification and enhancement to the existing Well Information System (WIS). In addition to assisting with the design and development of the required system changes, the branch devoted considerable effort to the testing of these changes as well as to the updating of various royalty/tax data files being converted to facilitate the new method of calculation.

The branch continued to play an active role in representing the department in a joint industry/ government task force on standardization of reporting requirements, procedures and formats. While discussions are continuing on standardization of the remaining reporting formats, issues related to standardization initiated in the previous year were also addressed to further simplify and streamline the data reporting and collection process. As well, the branch was also an active participant in the Canadian Petroleum Association Standing Committee on the development of Electronic Data Interchange (EDI) for the oil and gas industry. Significant progress had been accomplished at year end with the completion of a feasibility report setting the stage for further discussions on implementation issues and startup of pilot projects.